CLAIMS

We claim:

1. A method for increasing efficiency of amplification of nucleic acids, comprising:

(a) mixing nucleic acid templates, one or more primers, nucleotides, a first DNA polymerase and a second DNA polymerase that has 3' exonuclease activity, to form a reaction mixture; and

(b) adding to the reaction mixture a zwitterion and a compound that disrupts base pairing in an amount sufficient to increase amplification of an 80% G+C, 500 bp DNA fragment by two-fold, when the zwitterion and the compound are present as compared to when the zwitterion and the compound are absent.

2. The method of claim 1 wherein the first DNA polymerase lacks 5'→ 3' exonuclease activity.

3. The method of claim 1 wherein the first DNA polymerase is *Taq* DNA polymerase that lacks 5' → 3' exonuclease activity and the second DNA polymerase is *Pfu* DNA polymerase.

4. The method of claim 1 wherein the first DNA polymerase is r*Tth* DNA polymerase and the second DNA polymerase is *Thermococcus litoralis* DNA polymerase.

5. The method of claim 1 wherein the first DNA polymerase is *Taq* DNA polymerase and the second DNA polymerase is *Pyrococcus* DNA polymerase.

6. The method of claim 1 wherein the first DNA polymerase is *Taq* DNA polymerase and the second DNA polymerase is *Pwo* DNA polymerase.

7. The method of claim 1 wherein the zwitterion is selected from the group consisting of betaine, monomethyl glycine, dimethyl glycine, and D-carnitine.

8. The method of claim 1 wherein the zwitterion is betaine.

9. The method of claim 1 wherein the compound is dimethylsulfoxide.

10. The method of claim 1 wherein the zwitterion is betaine and the compound is DMSO.

11. The method of claim 10 wherein betaine is present at a concentration from about 0.5 M to about 3 M and DMSO is present from about 5% to about 15%.

12. The method of claim 10 wherein betaine is present at a concentration from about 1.0 M to about 2.5 M and DMSO is present from about 5% to about 10%.

13. The method of claim 1 wherein the nucleic acid template is selected from the group consisting of genomic DNA, cDNA, plasmid DNA, DNA fragment, and viral DNA.

14. A method for increasing efficiency of amplification of a nucleic acid, comprising:

(a) mixing a homogeneous nucleic acid template, one or more primers, nucleotides, a first DNA polymerase and a second DNA polymerase that has 3' exonuclease activity, to form a reaction mixture; and

(b) adding to the reaction mixture a zwitterion or a compound that disrupts base pairings in an amount sufficient to increase amplification of an 80% G+C, 500 bp DNA fragment by two-fold, when the zwitterion or compound are present as compared to when the zwitterion or compound are absent.

15. The method of claim 14 wherein the first DNA polymerase lacks 5' → 3' exonuclease activity.

16. The method of claim 14 wherein the zwitterion is betaine.

17. The method of claim 14 wherein the compound is dimethylsulfoxide.

18. The method of claim 14 wherein the first DNA polymerase is *Taq* DNA polymerase that lacks 5' → 3' exonuclease activity.and the second DNA polymerase is *Pfu* DNA polymerase.